

## Patent Claims

1. Battery with miniaturised SOFC fuel cells, including the following components:  
 a multi-modular unit (20) formed with the fuel cells (2) as modules, the volume of which is less than  $10^{-3}\text{m}^3$ , preferably less than  $10^{-4}\text{m}^3$ ,  
 a channel system (24, 25, 26) in the channels of which reactants, on the one hand, namely gaseous fuel (50) and also air (40) can be fed to the cells (2) and, on the other hand, the fuel which is partially depleted in the cells can be subjected to afterburning,  
 a casing (10, 11), which is at least partially made heat insulating,  
 a heat exchanger (6) which is part of the channel system and in which the air supplied can be heated up with exhaust gas (60),  
 an apparatus (4) or means for feeding the air,  
 an exchangeable or refillable reservoir (5) for the fuel, which is stored in this at a pressure which is greater than the environmental pressure and in which the fuel is preferably liquid,  
 controlled valves (51) in connection lines for the reactants and  
 a control,  
 wherein the fuel cells respectively contain a disc-shaped solid electrolyte (30), which in addition to ion conducting components also includes electron conducting components which cause an ohmic loss and wherein the quantity ratio of these components is so designed that in an idling operation of the battery a heat flow from the cells to the environment can be compensated by the ohmic loss.
  
2. A battery in accordance with claim 1, characterised in that the solid electrolyte is made up of  $\text{Sr}_4\text{Fe}_6\text{O}_{13}$  doped with La and/or Ti, that it is a perovskite of the composition  $(\text{La}, \text{Sr})(\text{Co}, \text{Fe})\text{O}_3$  or that it is cer-oxide doped with Gd, Y and/or Sm, wherein the transfer number of

the oxygen ions measured at the operating temperature with simultaneous transport of the oxygen ions and electrons has a value between 0.6 and 0.9 and in that mechanically stable support structures (2a, 2b) for the disc-shaped solid electrolytes are manufactured from crystalline silicon, which is structured by means of micro-technical methods.

3. A battery in accordance with claim 1 or claim 2, characterised in that it includes a condenser (7), in particular a super condenser, by means of which peaks of the power requirement, which occur intermittently are covered and that the condenser at least partially produces a heat insulation in the casing (10).
4. A battery in accordance with one of the claims 1 to 3, characterised in that an overpressure is produced in the gas-filled fuel cells (2) and channels by means of organs (44, 46, 61, 62) with which the transport of the air (40) and of the exhaust gas (60) can be affected, wherein the air supplied as a negative source of heat and also as a reactant together with the fuel (50) effects a thermodynamic working performance on the gases and a part of the pressure energy, which is stored in the exhaust gas, is used in the apparatus (4) for supplying the air.
5. A battery in accordance with one of the claims 1 to 4, characterised in that the fuel (50) is butane or propane.
6. A battery in accordance with one of the claims 1 to 5, characterised in that it has a capacity given by the amount of fuel, that when the fuel reservoir (5) is full the capacity of the battery (1) amounts to at least 3,000 mAh, that the fuel cells (2) switched in series produce a

terminal voltage of 3.6V and that the battery has a diameter of between 2 and 3 cm and a height of between 2,5 and 3, 5 cm.

7. A method for operating the battery in accordance with one of the claims 1 to 6, characterised in that, when there is no requirement for electric power, the feeding to the reactants (40, 50) into the fuel cells (2) is maintained at a low level, so that in this idling state, the temperature in the cells remains high, namely so high that a transfer from the idling state into a energy-delivering normal operating state is possible within a pre-given length of time, wherein this length of time is 10 minutes for example, preferably less than 1 minute.
8. A method in accordance with claim 7, characterised in that in the idling state the temperature of the cells (7) is less than in the energy-delivering normal operating state and that the difference between the temperatures in the normal operating state and in the idling state is advantageously less than 100° K.
9. The use of the battery in accordance with one of the claims 1 to 6, characterised in that it serves as a mobile energy source for electronic gadgets, which require a relatively high and regular energy supply, and/or that it serves as a substitution for re-loadable batteries.